

ABSTRACT

The iron-based rare-earth nanocomposite magnet of the present invention has a composition $T_{100-x-y-z-n}Q_xR_yTi_zM_n$, where T is Fe or a transition metal element in which Fe is partially replaced by Co and/or Ni; Q is B and/or C; R is at least one rare-earth element including substantially no La or Ce; and M is at least one metal element selected from Al, Si, V, Cr, Mn, Cu, Zn, Ga, Zr, Nb, Mo, Ag, Hf, Ta, W, Pt, Au and Pb. x, y, z and n satisfy $5 \leq x \leq 10$ at%, $7 \leq y \leq 10$ at%, $0.1 \leq z \leq 5$ at% and $0 \leq n \leq 10$ at%, respectively. The magnet includes $R_2Fe_{14}B$ -type compound phases and α -Fe phases forming a magnetically coupled nanocomposite magnet structure. The $R_2Fe_{14}B$ -type compound phases have an average crystal grain size of 30 nm to 300 nm and the α -Fe phases have an average crystal grain size of 1 nm to 20 nm. The magnet has magnetic properties including a coercivity of at least 400 kA/m and a remanence of at least 0.9 T.